3. Proposed by CHARLES E. MYERS, Canton, Ohio.

A spherical air-bubble, having risen from a depth of 1,500 feet in water, was one inch in diameter when it reached the surface; what was its diameter at the point of starting?

4. Proposed by DeVOLSON WOOD, M.A., C. E., Professor of Mechanical Engineering, Stevens Institute of Technology, Hoboken, New Jersey.

A particle starts at rest and revolves in a circle with a uniform acceleration, acquiring a velocity v in t seconds. Find the locus of the foot of the perpendicular from the centre of the circle upon the resultant acceleration.

5. Proposed by J. R. BALDWIN. A. M., Professor of Mathematics and Commercial Law, Davenport Business College, Davenport, Iowa.

A 200 pound ball lies on a three legged table, having the legs equally distant apart and perpendicular to the plane of the top of the table. (1) What is the weight on each leg of the table not including the top when the ball is 2 feet, 3 feet, and 4 feet distant from the three legs? (2) If the ball is 2 feet, 3 feet, and 5 feet from the legs, what must be the weight of the top to keep from tipping and the weight on each leg excluding the top and also including the top?

DIOPHANTINE ANALYSIS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

PROBLEMS.

1. Proposed by EARL D. WEST, West Middleburg, Logan County, Ohio.

It is required to divide a given square number into two such parts that each part will be a square number.

2. Proposed by J. M. COLAW, Principal of High School, Monterey, Virginia.

Find two numbers, such that the difference of their squares may be a cube, and the difference of their cubes a square.

3. Proposed by O. S. KIBLER, Superintendent of Schools, West Middleburg, Logan County, Ohio.

It is required to find three whole numbers in an arithmetical progression, such that the sum of every two of them shall be a square.

4. Proposed by H. W. HOLYCROSS, Superintendent of Schools, Pottersburg, Union County, Ohio.

What value of x will render $4x^4+12x^3-3x^2-2x+1$ a square?

AVERAGE AND PROBABILITY.

Conducted by B. F. FINKEL, Kidder, Missouri. All contributions to this department should be sent to him.

PROBLEMS.

1. **Proposed by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.**

Three persons A, B, C, throw with three dice. They each stake $10.00 and the one who first throws at least ten with the three dice takes the whole stake. Find the expectation of each.

2. **Proposed by O. S. KIBLER, Superintendent of Schools, West Middleburg, Logan County, Ohio.**

What is the average area of a triangle formed by joining an angle of a square with any two points within the square?

3. **Proposed by MISS LECTA MILLER, B. L., Professor of Natural Science and Art, Kidder Institute, Kidder, Missouri.**

A deer, wounded at the corner of a square park, is equally liable to run in a straight line in any direction, from the corner of the park, and, at the same time, is also equally liable to drop dead before running a distance equal to the diagonal of the park. What is the chance that the deer will drop dead in the park?

MISCELLANEOUS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

PROBLEMS.

1. **Proposed by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.**

To divide the arc of a cycloid into eight equal parts.

2. **Proposed by SYLVESTER ROBINS, Long Branch Depot, New Jersey.**

Give the dimensions of thirteen rational trapezoids each one having 1885 for its parallel bisector; and as many more wherein each bisector is 1105.

3. **Proposed by J. A. CALDERHEAD, Limaville, Ohio.**

Given the simultaneous angular velocities of a body about the principal axes through its center of inertia, find the position of these axes in space at any assigned instant.

4. **Proposed by J K ELLWOOD, A. M., Principal of Colfax School, Pittsburg, Pennsylvania.**

I have two circular grindstones, each ½ in. thick. One is 6 in. and the other 4½ in. in diameter, the aperture at center of each being 1½ in. If when in motion they are continually tangent to each other, and ½ cu. in. is ground off the larger wheel and ¼ cu. in. off the smaller in the first hour, how must their speed be increased so that the same amount per hour may be ground off each wheel until one is worn out? If in the first hour the larger wheel makes a revolutions, and the smaller b, how many must each make in each succeeding hour?

QUERIES AND INFORMATION.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him.

The difinition of the root of an equation is that it must satisfy the equation if substituted in it, that is, that it must produce an identity. But in the equation